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LETTERS TO THE EDITOR

Synthesis of Aromatic Ketones

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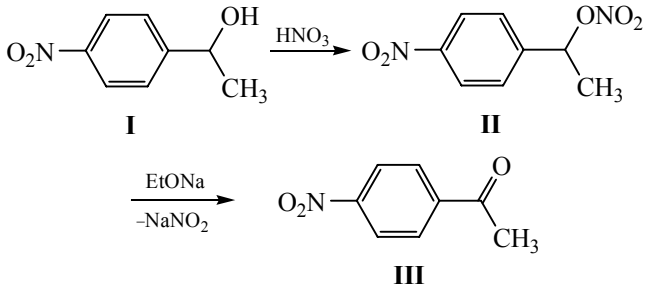
One of the methods of the synthesis of aromatic ketones is treating of alkylarylcarbinol esters by alkali. For example, a treatment of nitrates of nitrophenylmethylcarbinol regioisomers by aqueous or alcoholic solution of sodium hydroxide results in the corresponding acetophenone derivatives [1, 2]. In this case, nitroesters were cleaved under cooling for 3–3.5 h in the case of *p*- and *m*-isomers and up to 33 h in the case of *o*-nitrophenylmethylcarbinol.



Obviously, the electron density distribution, which is determined by the substituent type in the aromatic ring, its location, and the length of the alkyl group has an effect on the reactivity of the ester. In the above cases, the substrate attacked by a HO^- nucleophile contains a strong electron acceptor in the aromatic ring and the smallest aliphatic substituent, but the reaction time described by Kochergin et al. is too long. Thus, the synthesis by this method of ketones containing the acyl residue in the aromatic ring is an actual task.

The aim of this work is to study the reaction of phenylalkylcarbinols esters with alkoxide anions exemplified by the synthesis of 4-nitroacetophenone.

The nitration of the initial nitroalcohol **I** was carried out at a higher temperature without excessive pre-processing of nitric acid by urea and at a shorter reaction time (~ 5 times) than described in [2]. The nitrate **II** obtained in a high yield melts in a narrow range and contains a small amount of 4-nitroacetophenone impurity (according to the ^{1}H NMR). It was used without further purification.

Since the alkoxy anions are more nucleophilic, the use of alkali metal alkoxides instead of their hydroxides provides the rapid proton elimination and an increase in the reaction rate. In this work sodium ethoxide was used as an alkaline reagent. It allows to carry out the reaction under the homogeneous conditions and to reduce 9 times the reaction time for the synthesis of 4-nitroacetophenone.

Nitric acid of d_4^{20} 1.488 g cm^{-3} was used for nitration.

Synthesis of 1-(4-nitrophenyl)ethyl nitrate. To 15 ml of HNO_3 cooled to –1°C was added dropwise 4.18 g (0.025 mol) of *d*,*l*-1-(4-nitrophenyl)ethanol within 10–12 min at 0–3°C under stirring. After the completion of the addition, the reaction mixture was cooled to –5°C and poured into 100 cm^3 of crushed ice. Yellow liquid gathered on the flask bottom. The mixture was stirred, and the product crystallizes. The process was accompanied by an endothermic effect. The precipitate was filtered off, washed with water, and triturated in water. The resulting finely crystalline substance was repeatedly washed with water, then twice with Na_2CO_3 at pH ≈ 7.5 and several times with water. The resulting *d*,*l*-1-(4-nitrophenyl)ethylnitrate was dried in air. Yield 4.51 g (85%), light yellow crystalline solid, mp 31–32°C. ^{1}H NMR spectrum, δ_H, ppm: 1.69 d (3H, CH_3, *J* 6.7 Hz), 6.33 q (1H, CH), 7.85 d (2H, 2,6-Ar, *J* 8.7 Hz), 8.34 d (2H, 3,5-Ar, *J* 8.8 Hz).

Synthesis of 4-nitroacetophenone. To a solution of 4.43 g (0.02088 mol) of 1-(4-nitrophenyl)ethyl nitrate in 45 ml of anhydrous ethanol was added under stirring at 22–25°C by portions within 15 min a solution of EtONa prepared from 0.48 g of Na and 25 ml of anhydrous ethanol. The resulting dark red mixture was stirred for 5 min. The pH of the solution was adjusted to 7 by adding a few drops of CH_3COOH. Yellow mineral precipitate was filtered off, washed with warm anhydrous ethanol, then with diethyl ether, and dried to give 0.85 g of colored microcrystalline $NaNO_2$. Yellow precipitate sedimented from a filtrate after standing, it was filtered off, washed subsequently with ethanol, diethyl ether, and dried to yield 0.12 g of $NaNO_2$. The solution was evaporated in a vacuum to give thick slurry. To a slurry was added 50 ml of water, and the colored mixture became bright yellow. The precipitated 4-nitroacetophenone was filtered off and washed twice with water. Then, 4-nitroacetophenone was filtered off from an aqueous solution of 0.12 g $NaNO_2$ obtained earlier, washed with water, combined and dried in air. Yield 3.31 g (96%), mp 79–80°C. ^{1}H NMR spectrum, δ_H, ppm: 2.74 s (3H, CH_3), 8.26 d (2H, 2,6-Ar, *J* 8.8 Hz), 8.39 d (2H, 3,5-Ar, *J* 8.8 Hz). ^{13}C NMR spectrum, d_C, ppm: 26.79 (CH_3), 124.00 (3,5-Ar), 129.79 (2,6-Ar), 141.87 (1-Ar), 150.48 (4-Ar), 197.05 (C=O).

The NMR spectra were recorded on a Bruker Avance II 400 spectrometer [^{1}H (400.1 MHz), ^{13}C (100.6 MHz)], solvent – DMF-d_7.

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